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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/Gradation/2015-16

07.01.2016

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **Mr. B.B. Umesh,**
#385, Bettaulsur (P), Bangalore North Taluk.

Name of Work : Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.

Reference : EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015

Date of Testing : 07.01.2016

Material : WMM

Sample Location : WMM Mix Plant

Oven Dry Wt (gm): **5000**

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	135	135	2.7	97.3	95-100
22.4	1525	1660	33.2	66.8	60-80
11.2	1050	2710	54.2	45.8	40-60
4.75	630	3340	66.8	33.2	25-40
2.36	485	3825	76.5	23.5	15-30
0.600	415	4240	84.8	15.2	8-22
0.075	465	4705	94.1	5.9	0-8

Note:

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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/Gradation/2015-16

07.01.2016

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **Mr. B.B. Umesh,**
#385, Bettaulsur (P), Bangalore North Taluk.

Name of Work : Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.

Reference : EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015

Date of Testing : 07.01.2016

Material : WMM

Sample Location : WMM Mix Plant

Oven Dry Wt (gm): **5000**

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	185	185	3.7	96.3	95-100
22.4	1650	1835	36.7	63.3	60-80
11.2	1020	2855	57.1	42.9	40-60
4.75	650	3505	70.1	29.9	25-40
2.36	695	4200	84.0	16.0	15-30
0.600	320	4520	90.4	9.6	8-22
0.075	315	4835	96.7	3.3	0-8

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Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Source / Location	WMM Plant
Type of Mix	Wet Mix macadam
Date of Testing	07.01.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	388	390	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	85	86	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	303	304	
4	Aggregate Impact value = percent fines	21.91	22.05	
	100* (W_2/W_1)%			21.98

Comments:

→ Maximum allowable Aggregate Impact value for Wet mix Macadam is 30%

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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/AIV/2015-16 07.01.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Source / Location	WMM Plant
Type of Mix	Wet Mix macadam
Date of Testing	07.01.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	380	381	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	78	80	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	302	301	
4	Aggregate Impact value = percent fines	20.53	21.00	
	100* (W_2/W_1)%			**20.76**

Comments:

→ Maximum allowable Aggregate Impact value for Wet mix Macadam is 30%

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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/S-T/2015-16 07.01.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Technical Reference	IS 2386(Part 1) 1963 (RA 2011)
Type of Mix	Wet Mix Macadam
Date of Testing	07.01.2016

Result : Flakiness Index = **12.32%**

Elongation Index = **13.90%**

Result : Combined Flakiness & Elongation index 26.22%

Comments:

Maximum allowable Flakiness & Elongation Index for Wet Mix Macadam is 30%

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Job No.: CTCE/BBMP/W.No.09/BBU/WMM/S-T/2015-16 07.01.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Technical Reference	IS 2386(Part 1) 1963 (RA 2011)
Type of Mix	Wet Mix Macadam
Date of Testing	07.01.2016

Civil-Tech Consultants & Engineers Bangalore

Result : Flakiness Index = **13.25%**

Elongation Index = **13.90%**

Result : Combined Flakiness & Elongation index 27.15%

Comments:

Maximum allowable Flakiness & Elongation Index for Wet Mix Macadam is 30%

Note:

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Basaveshwaranagar, Bangalore-560 079.

#23/14, 7th Cross, 3rd Stage, 4th Block, Shakthi Ganapathi Nagara, Basaveshwaranagar, Bangalore-79.
Tele Fax : 23223227, Website : www.civiltechconsultants.com
E-mail : vishwanath.ia@civiltechconsultants.com / info@civiltechconsultants.com

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T-2377

Job No: CTCE/BBMP/W.No.09/BBU/CSR-01/1042j/SDBC(QB)/2015-16 11.01.2016

TEST REPORT ON DETERMINATION OF BITUMEN CHARACTERISTICS

*CUSTOMER	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
*AGENCY	:	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
*NAME OF THE WORK	:	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	:	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
*SAMPLE ID	:	Bitumen
DATE OF SAMPLING	:	09.01.2016
PERIOD OF TESTING	:	11.01.2016

The results of the tests conducted on the bitumen sample using for Semi Dense Bituminous Concrete.

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2013
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	82	80 to 100
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	43	Min. 40
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	100 >	Min. 75
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	296	Min. 220

*Information is furnished by the Customer/Representative.

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VIDYARANI P.K.
Technical Manager

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Tele Fax : 23223227, Website : www.civiltechconsultants.com
E-mail : vishwanath.ia@civiltechconsultants.com / info@civiltechconsultants.com

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/AIV/2015-16 11.01.2016

Aggregate Impact Value
IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	11.01.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	382	383	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	82	83	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	300	300	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	21.47	21.67	21.57

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Shape_T/2015-16 11.01.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Technical Reference	IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	11.01.2016

Result : Flakiness Index = **11.64%**

Elongation Index = **13.28%**

Result : Combined Flakiness & Elongation index **24.92%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Stripping/2015-16 13.01.2016

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	13.01.2016

Type of binder : 80/100
Percentage of binder used : 5.0% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.0 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	3.5	3.47	96.53
2	3.6		
3	3.3		

Comments:

→ Minimum allowable Aggregate retained coating for Semi Dense Bituminous Concrete is 95 %

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Sp_Wa/2015-16 13.01.2016

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Type of Mix	Semi Dense Bituminous Concrete
Source / Location	Hotmix Plant, Bangalore
Date of Testing	13.01.2016

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	2012	2013	2014	
2	Weight of basket suspended in water	W_2 g	750	750	750	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1262	1263	1264	
4	Weight of saturated surface dry aggregate in air	W_3 g	2018	2019	2020	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	756	756	756	
6	Weight of oven dried aggregate	W_4 g	2008	2004	2005	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.656	2.651	2.652	2.653
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.692	2.704	2.706	2.701
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.50%	0.75%	0.75%	0.66

Comments:

→ Maximum allowable Aggregate Water absorption value for Semi Dense Bituminous Concrete is 2%

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Bitumen/2015-16 13.01.2016

BITUMEN DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AS per IRC : SP : 11 - 1984

CUSTOMER	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
AGENCY	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
NAME OF THE WORK	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
SAMPLE I/D	Roads in Canara Bank Layout Ward No.09, BBMP, Bangalore.
DATE OF TESTING	13.01.2016

BITUMEN CONTENT DETERMINATION

Description	Trail 1	Trail 2
1. Weight of Mixture before Test, g	500	500
2. Weight of Mixture after Test, g	475	474
3. Weight of Asphalt and Mineral matter Extracted, g	-	-
4. Weight of Mineral Matter, g.	-	-
5. Weight of Ash, g		
6. Weight of Bitumen Extracted, g. (corrected)	25	26.00
7. Bitumen content in %	5.00	5.20
8. Average	**5.10**	

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Bitumen/2015-16 13.01.2016

GRADATION DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

As per IS : 2386 and IRC : SP : 11 - 1984

CUSTOMER	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
AGENCY	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
NAME OF THE WORK	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated:
SAMPLE I/D	Roads in Canara Bank Layout Ward No.09, BBMP, Bangalore.
DATE OF TESTING	13.01.2016

GRADATION AFTER EXTRACTION

Sieve Size in mm	Trail 1				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	25.69	5.41	5.41	94.59	90-100
4.75	255.9	53.87	59.28	40.72	35-51
2.36	55.65	11.72	71.00	29.00	24-39
1.18	51.23	10.79	81.78	18.22	15-30
0.3	25.2	5.31	87.09	12.91	9-19
0.075	36.65	7.72	94.80	5.20	3-8

Sieve Size in mm	Trail 2				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	32.65	6.89	6.89	93.11	90-100
4.75	255.8	53.97	60.85	39.15	35-51
2.36	56.35	11.89	72.74	27.26	24-39
1.18	40.25	8.49	81.23	18.77	15-30
0.3	22.32	4.71	85.94	14.06	9-19
0.075	30.22	6.38	92.32	7.68	3-8

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Basaveshwaranagar, Bangalore-560 079.

#23/14, 7th Cross, 3rd Stage, 4th Block, Shakthi Ganapathi Nagara, Basaveshwaranagar, Bangalore-79.

Tele Fax : 23223227, Website : www.civiltechconsultants.com

E-mail : vishwanath.ia@civiltechconsultants.com / info@civiltechconsultants.com

CIVIL-TECH CONSULTANTS AND ENGINEERS

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/AGG/2015-16 13.01.2016

Aggregate Gradation Test

IS : 2386 Part I

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP,
Agency	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Sample I / D	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete (SDBC)
Date of Testing	13.01.2016

Total Weight of Sample: **5150** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	435	8.4	8.45	91.55	90-100	
4.75	2850	55.3	63.79	36.21	35-51	
2.36	525	10.2	73.98	26.02	24-39	
1.18	415	8.1	82.04	17.96	15-30	
0.3	355	6.9	88.93	11.07	9-19	
0.075	300	5.8	94.76	5.24	3-8	

Total Weight of Sample: **5250** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	305	5.8	5.81	94.19	90-100	
4.75	2850	54.3	60.10	39.90	35-51	
2.36	635	12.1	72.19	27.81	24-39	
1.18	415	7.9	80.10	19.90	15-30	
0.3	350	6.7	86.76	13.24	9-19	
0.075	485	9.2	96.00	4.00	3-8	

Note:

Þ This test report should not be reproduced except in full, without written approval of the laboratory.

Þ The results indicated above are based on the tests carried out on the samples received in the laboratory.

Þ Any Query regarding the report must be reported within 30 days from the date of testing

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#23/14, 7th Cross 3rd Stage 4th Block,
Shakthi Ganapathinagar,
Basaveshwaranagar, Bangalore-560 079.

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Job No.: CTCE/BBMP/W.No.09/BBU/SDBC/Stability/2015-16 13.01.2016

TEST REPORT ON STABILITY OF MIX

Customer	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	:	**Mr. B.B. Umesh,** #385, Bettaulsur (P), Bangalore North Taluk.
Name of the Work	:	Improvements & Asphalting to Canara Bank Layout Cross Roads in Ward No.09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	:	EE/BTP/BBMP/E-PMT/10(16516)WO/370/2014-15 Dated: 24.03.2015
Source of location	:	Hot mix Plant, Bangalore
Type of Mix	:	Semi Dense Bituminous Concrete
Date of Testing	:	13.01.2016

The results of the tests conducted on the Semi Dense Bituminous Concrete mix sample are as follows:

Sl. No	Description	Test Result 1	Test Result 2	Requirement as per MORTH (Table 500-16)
1	Marshal Stability, Kn	8.65	8.95	8.2 Kn (min)
2	Marshal flow, mm	3.15	3.20	2 – 4
3	Percent air voids in Mineral Aggregate	3.65	4.10	3 – 5
4	Voids in Compacted Mix	13.40	14.15	13 – 15
5	Percent Voids filled with Bitumen	66.25	67.50	65 - 78
6	Density, g/cc	2.26	2.28	--

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Note:

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#23/14, 7th Cross 3rd Stage 4th Block,
Shakthi Ganapathinagar,
Basaveshwaranagar, Bangalore-560 079.